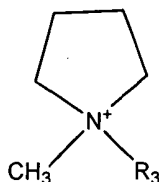
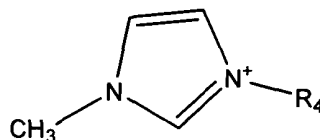


WHAT IS CLAIMED IS:

1. An electrolyte solution having a Tg of less than about -40°C , comprising at least one bifunctional redox dye dissolved in ionic liquid solvent.
2. The electrolyte solution of claim 1, wherein said bifunctional redox dye comprises at least one redox active anodic moiety and at least one redox active cathodic moiety.
3. The electrolyte solution of claim 1, wherein said bifunctional redox dye comprises at least one energy receptor moiety and at least one redox active anodic moiety, at least one energy receptor moiety and at least one redox active cathodic moiety, or at least one energy receptor moiety and at least one redox active anodic moiety and at least one redox active cathodic moiety.
4. The electrolyte solution of claim 1, wherein said ionic liquid solvent comprises at least one cation selected from the group consisting of lithium cation and quaternary ammonium cations, wherein said quaternary ammonium cations are selected from the group consisting of pyridinium, pyridazinium, pyrimidinium, pyrazinium, imidazolium, pyrazolium, thiazolium, oxazolium, triazolium, tetraalkylammonium, N-methyl morpholinium, cations of the formula $[(\text{CH}_3\text{CH}_2)_3\text{N}(\text{R}_1)]^+$, wherein R_1 is alkyl having 2-10 carbons, cations of the formula $[(\text{CH}_3)_2(\text{CH}_3\text{CHCH}_3)\text{N}(\text{R}_2)]^+$, wherein R_2 is alkyl having 2-10 carbons, cations having the structural formula



- 10 wherein R_3 is alkyl having 2-10 carbons, and cations having the structural formula

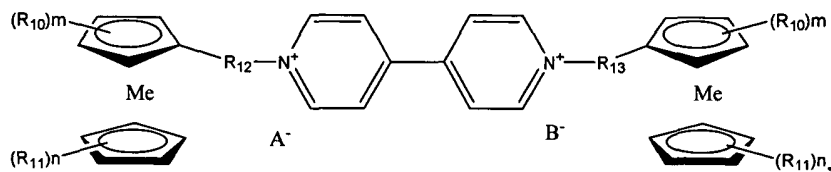


wherein R_4 is alkyl having 2-10 carbons.

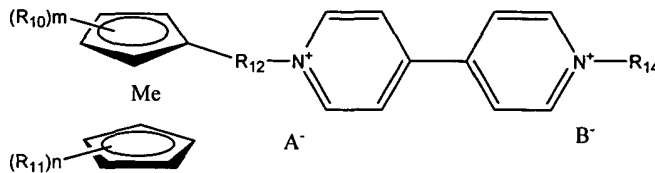
5. The electrolyte solution of claim 1, wherein said ionic liquid comprises at least one anion selected from the group consisting of trifluoromethylsulfonate (CF_3SO_3^-), bis(trifluoromethylsulfonyl)imide ($(\text{CF}_3\text{SO}_2)_2\text{N}^-$), bis(perfluoroethylsulfonyl)imide ($(\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-$) and tris(trifluoromethylsulfonyl)methide ($(\text{CF}_3\text{SO}_2)_3\text{C}^-$).

6. The electrolyte solution of claim 2, wherein said anodic moiety of said bifunctional redox dye comprises a pyrazoline, metallocene, phenylenediamine, benzidine, phenoxadine, phenothiazine, tetrafulvalene or phenazine, and said cathodic moiety of said bifunctional redox dye comprises a viologen or anthraquinone.

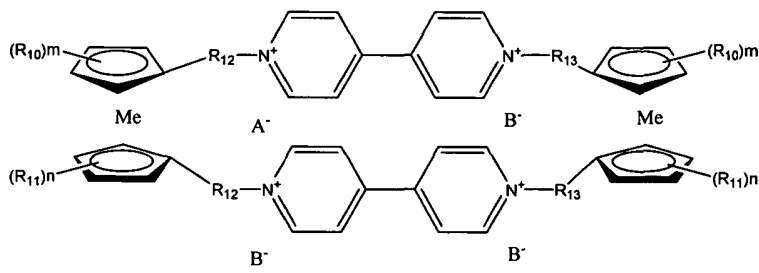
7. The electrolyte solution of claim 1, wherein said bifunctional redox dye is a compound having the structural formula



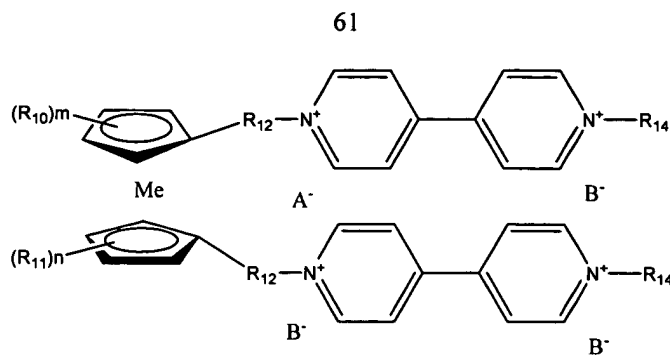
or having the structural formula



or having the structural formula



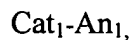
or having the structural formula



- 10 wherein A^- is selected from the group consisting of trifluoromethylsulfonate ($CF_3SO_3^-$), bis(trifluoromethylsulfonyl)imide ($((CF_3SO_2)_2N^-)$), bis(perfluoroethylsulfonyl)imide ($((CF_3CF_2SO_2)_2N^-)$) and tris(trifluoromethylsulfonyl)methide ($((CF_3SO_2)_3C^-)$); B^- is selected from the group consisting of a halogen anion, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , and $CH_3(C_6H_4)SO_3^-$, trifluoromethylsulfonate ($CF_3SO_3^-$), bis(trifluoromethylsulfonyl)imide
- 15 $((CF_3SO_2)_2N^-)$, bis(perfluoroethylsulfonyl)imide ($((CF_3CF_2SO_2)_2N^-)$) and tris(trifluoromethylsulfonyl)methide ($((CF_3SO_2)_3C^-)$); wherein R_{10} and R_{11} are each independently a hydrocarbon group selected from the group consisting of an alkyl, alkenyl and aryl group having 1 to 10 carbon atoms, in the case where R_{10} or R_{11} is an aryl group, the aryl group forms a condensed ring together with a cyclopentadienyl ring; wherein $m=0-4$; wherein $n=0-4$; wherein R_{12} and R_{13} are each independently a hydrocarbon residue
- 20 having 1 to 20 carbon atoms, or alkylene groups having ester-bond unit, ether-bond unit, amide-bond unit, thioether-bond unit, amine-bond unit, urethane-bond unit, or silyl unit in the part of hydrocarbon groups, and R_{14} is a hydrocarbon group selected from the group consisting of an alkyl, cycloalkyl, alkenyl, aryl, or aralkyl group having 1 to 20 carbon
- 25 atoms, a heterocyclic group having 4 to 20 carbon atoms, and a substituted hydrocarbon or heterocyclic group obtained by substituting part of hydrogens of the hydrocarbon group or heterocyclic group with a substituent group; and Me represents Cr, Co, Fe, Mn, Ni, Os, Ru, V, Mo(X)(Q), Nb(X)(Q), Ti(X)(Q), V(X)(Q) or Zr(X)(Q) wherein X and Q are each independently selected from the group consisting of hydrogen, halogen, an alkyl group having 1 to 12 carbon atoms, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , $CH_3(C_6H_4)SO_3^-$, trifluoromethylsulfonate ($CF_3SO_3^-$), bis(trifluoromethylsulfonyl)imide ($((CF_3SO_2)_2N^-)$), bis(perfluoroethylsulfonyl)imide ($((CF_3CF_2SO_2)_2N^-)$) and
- 30 tris(trifluoromethylsulfonyl)methide ($((CF_3SO_2)_3C^-)$);

or having the formula

35



or having the formula



or having the formula



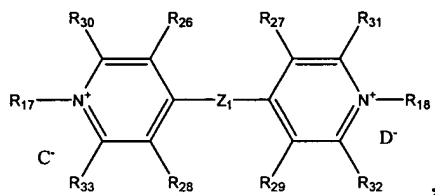
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or having the formula



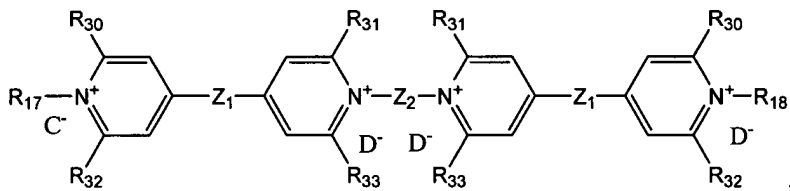
wherein Cat₁-An₁ represents a charge transfer complex;

wherein Cat₁ and Cat₂ independently represent a radical having the structural formula

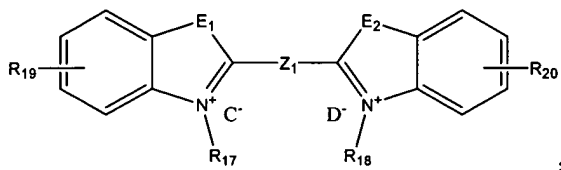


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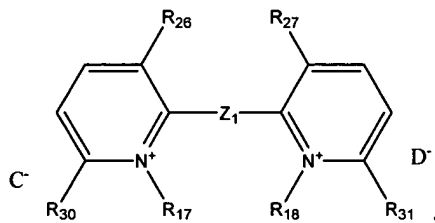
or having the structural formula



or having the structural formula



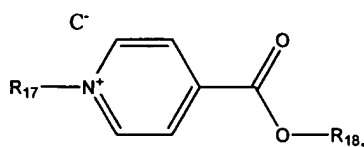
or having the structural formula



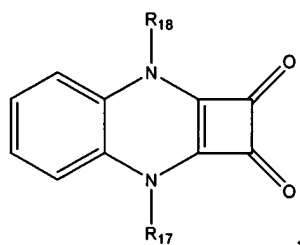
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or having the structural formula

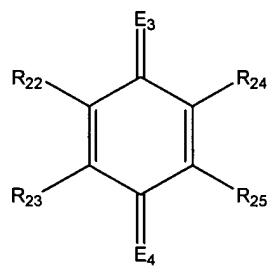
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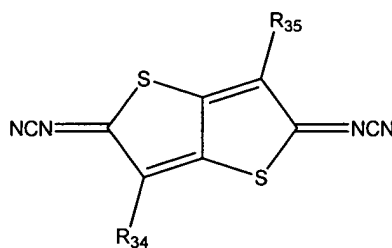
or having the structural formula



55 or having the structural formula



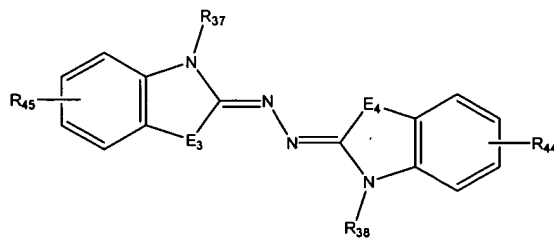
or having the structural formula



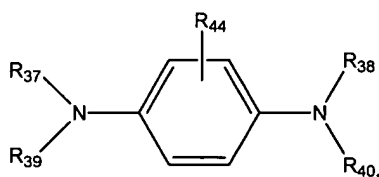
wherein R₁₇ and R₁₈ independently of one another denote C₁ to C₁₈ -alkyl, C₂ to C₁₂ -
 60 alkenyl, C₃ to C₇ -cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl or R₁₇ and R₁₈ together
 form a -(CH₂)₂-, -(CH₂)₃-, or -CH=CH- bridge, R₁₉, R₂₀ and R₂₂ to R₂₅ independently of
 one another denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₄ -alkoxy, halogen, cyano, nitro or
 C₁ to C₁₈ -alkoxycarbonyl or R₂₂ and R₂₃ and/or R₂₄ and R₂₅ form a -CH=CH-CH=CH-
 bridge; R₂₆, R₂₇, R₂₈ and R₂₉ independently of one another denote hydrogen or, in pairs, a
 65 -(CH₂)₂-, -(CH₂)₃- or -CH=CH- bridge, E₃ and E₄ independently of one another denote O,
 N-CN, C(CN)₂ or N-C₆ - to C₁₀-aryl, R₃₄ and R₃₅ independently denote hydrogen, C₁ to C₁₈
 -alkyl, C₁ to C₁₈ -alkoxy, halogen, cyano, nitro, C₁ to C₁₈ -alkoxycarbonyl or C₆ to C₁₀ -

aryl, R_{30} to R_{33} independently of one another denote hydrogen or C_1 to C_6 -alkyl, or R_{30} and R_{26} and/or R_{31} and R_{27} form a $-\text{CH}=\text{CH}-\text{CH}=\text{CH}-$ bridge, E_1 and E_2 independently of
70 one another denote O, S, NR_{36} or $\text{C}(\text{R}_{36})_2$ or E_1 and E_2 together form a $-\text{N}-(\text{CH}_2)_2-\text{N}-$ bridge, R_{36} denotes C_1 to C_{18} -alkyl, C_2 to C_{12} -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -
aralkyl or C_6 to C_{10} -aryl, Z_1 denotes a direct bond, $-\text{CH}=\text{CH}-$, $-\text{C}(\text{CH}_3)=\text{CH}-$,
 $-\text{C}(\text{CN})=\text{CH}-$, $-\text{CCl}=\text{CCl}-$, $-\text{C}(\text{OH})=\text{CH}-$, $-\text{CCl}=\text{CH}-$, $-\text{C}\equiv\text{C}-$, $-\text{CH}=\text{N}-\text{N}=\text{CH}-$, $-\text{C}(\text{CH}_3)=\text{N}-$
 $\text{N}=\text{C}(\text{CH}_3)-$ or $-\text{CCl}=\text{N}-\text{N}=\text{CCl}-$, Z_2 denotes $-(\text{CH}_2)_r-$ or $-\text{CH}_2-\text{C}_6\text{H}_4-\text{CH}_2-$, $r=1-10$, C^+ is
75 selected from the group consisting of bis(trifluoromethylsulfonyl)imide $((\text{CF}_3\text{SO}_2)_2\text{N}^+)$,
bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^+)$ and
tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^+)$, and D^+ is selected from the group
consisting of halogen anion, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , and
 $\text{CH}_3(\text{C}_6\text{H}_4)\text{SO}_3^-$, trifluoromethylsulfonate $(\text{CF}_3\text{SO}_3^-)$, bis(trifluoromethylsulfonyl)imide
80 $((\text{CF}_3\text{SO}_2)_2\text{N}^+)$, bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^+)$ and
tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^+)$, wherein bonding to the bridge
member bridge₁ or bridge₂ is effected via one of the radicals R_{17} - R_{36} , and the radicals
mentioned then represent a direct bond,
and wherein An_1 and An_2 independently represent radicals having the structural formula:

85

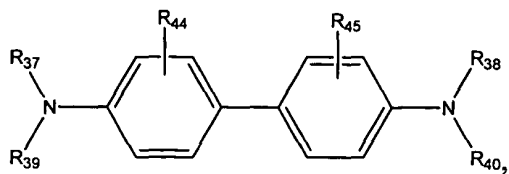


or having the structural formula



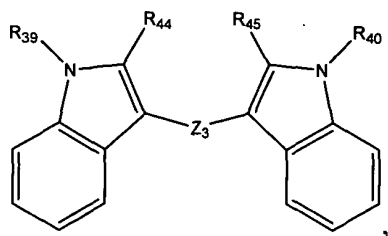
or having the structural formula

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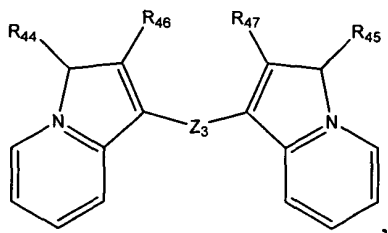


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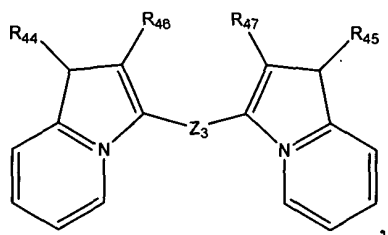
or having the structural formula



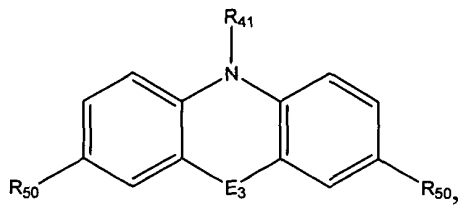
or having the structural formula



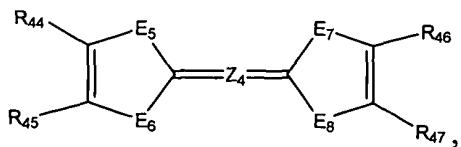
95 or having the structural formula



or having the structural formula



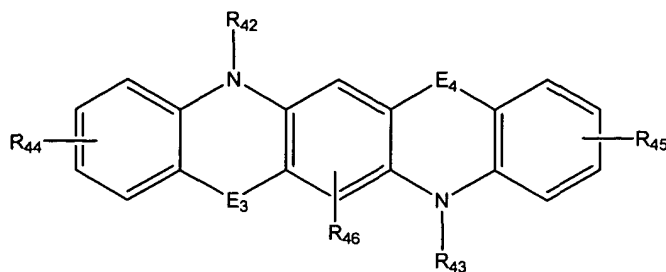
or having the structural formula



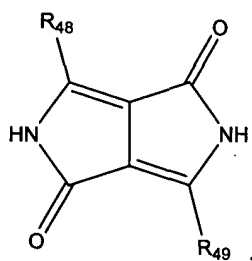
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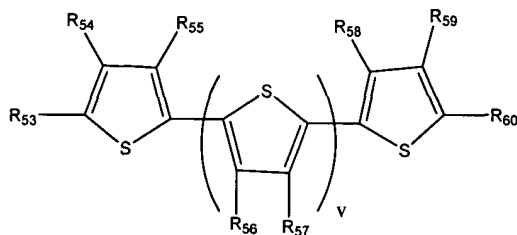
or having the structural formula



or having the structural formula



105 or having the structural formula

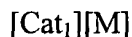


or wherein An₁ or An₂ independently represent a metal salt comprising titanium (III), vanadium (III), vanadium (IV), iron (II), cobalt (II), copper (I), silver (I), indium (I), tin (II), antimony (III), bismuth (III), cerium (III), samarium (II), dysprosium (II), ytterbium (II), or europium (II), wherein R₃₇ to R₄₃ independently of one another denote C₁ to C₁₈ -alkyl, C₂ to C₁₂ -alkenyl, C₃ to C₇ -cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl, and R₄₁ to R₄₃ additionally denote hydrogen, R₄₄ to R₅₀ independently of one another denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₁₈ -alkoxy, halogen, cyano, nitro, C₁ to C₁₈ -alkoxycarbonyl or C₆ to C₁₀ -aryl and R₄₈ and R₄₉ additionally denote an optionally benzo-
fused aromatic or quasiaromatic five- or six-membered heterocyclic ring and R₅₀
additionally independently denotes N(R₅₁)(R₅₂), R₄₄ and R₄₅ and/or R₄₆ and R₄₇ form a -
(CH₂)₃-, -(CH₂)₄-, -(CH₂)₅- or -CH=CH-CH=CH- bridge, Z₃ denotes a direct bond or a -
CH=CH- or -N=N- bridge, =Z₄= denotes a direct double bond or a =CH-CH= or =N-N=

bridge, E₃ and E₄ independently of one another denote O, S, NR₅₁, C(R₅₁)(R₅₂), C=O or
120 SO₂, E₅ to E₈ independently of one another denote S, Se or NR₅₁, R₅₁ and R₅₂
independently of one another denote C₁ to C₁₂ -alkyl, C₂ to C₈ -alkenyl, C₃ to C₇ -
cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl, R₅₃ to R₆₀ independently of one another
denote hydrogen, C₁ - to C₆ -alkyl, C₁ to C₁₈ -alkoxy, cyano, C₁ to C₁₈ -alkoxycarbonyl or
C₆ to C₁₀ -aryl, or R₅₃ and R₅₄ and R₅₉ and R₆₀ independently of one another together form
125 a -(CH₂)₃-, -(CH₂)₄- or -CH=CH-CH=CH- bridge, v=0-10, wherein bonding to the bridge
member Bridge₁ or Bridge₂ is effected by one of the radicals R₃₇ -R₅₄, or R₆₀ and the
radicals mentioned then represent a direct bond, and Bridge₁ or Bridge₂ independently
represents a bridge member of the formula -(CH₂)_n- or -(Y₁)_s(CH₂)_m-(Y₂)_o-(CH₂)_p-(Y₃)_q-,
each of which is optionally substituted by C₁ to C₁₈ -alkoxy, halogen or phenyl, Y₁ to Y₃
130 independently of one another independently represent O, S, NR₆₁, COO, CONH,
NHCONH, cyclopentanedyl, cyclohexanedyl, phenylene or naphthylene, beta-
dicarbonyls, R₆₁ denotes C₁ to C₆ -alkyl, C₂ to C₆ -alkenyl, C₄ to C₇ -cycloalkyl, C₇ to C₁₅ -
aralkyl or C₆ - to C₁₀ -aryl, n=0-12, m=0-8, p=0-12, o=0-6, q=0-1, and s=0-1.

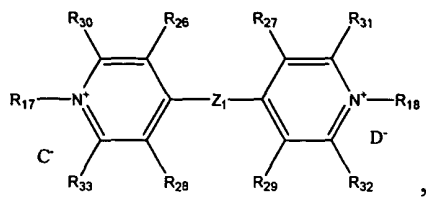
8. The electrolyte solution of claim 3, wherein said bifunctional redox dye comprises
a redox active moiety comprising a pyrazoline, metallocene, phenylenediamine, benzidine,
phenoxadine, phenothiazine, tetrafulvalene, phenazine, viologen or anthraquinone, and an
energy receptor moiety comprising a benzophenone, benzotriazole, or cyanoacrylate.

9. The electrolyte solution of claim 1, wherein said bifunctional redox dye comprises
a compound having the formula

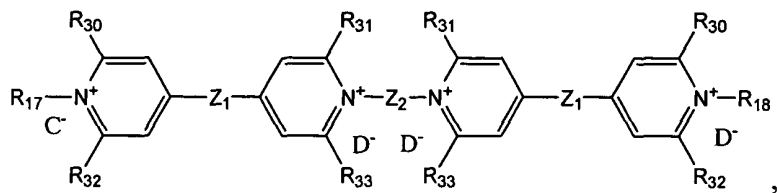


wherein M represents a metal salt comprising titanium (III), vanadium (III), vanadium
5 (IV), iron (II), cobalt (II), copper (I), silver (I), indium (I), tin (II), antimony (III), bismuth
(III), cerium (III), samarium (II), dysprosium (II), ytterbium (II), or europium (II);
wherein Cat₁ represents a ligand having the structural formula

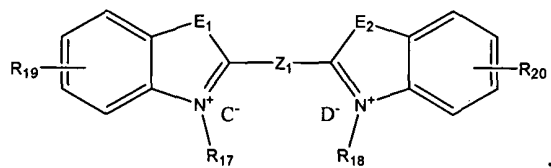
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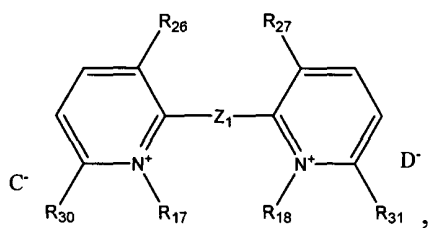
10 or having the structural formula



or having the structural formula

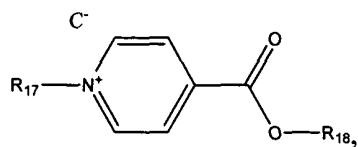


or having the structural formula

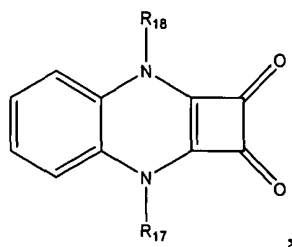


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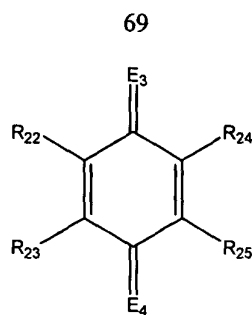
or having the structural formula



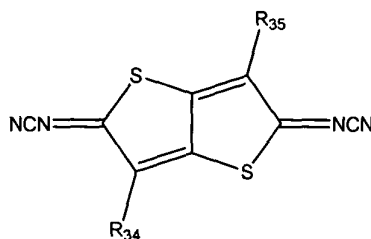
or having the structural formula



20 or having the structural formula



or having the structural formula



wherein R_{17} and R_{18} independently of one another denote C_1 to C_{18} -alkyl, C_2 to C_{12} -
 25 alkenyl, C_3 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or C_6 to C_{10} -aryl or R_{17} and R_{18} together
 form a $-(CH_2)_2-$, $-(CH_2)_3-$, or $-CH=CH-$, R_{19} , R_{20} and R_{22} to R_{25} independently of one
 another denote hydrogen, C_1 to C_{18} -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro or C_1 to
 C_{18} -alkoxycarbonyl or R_{22} and R_{23} and/or R_{24} and R_{25} form a $-CH=CH-CH=CH-$ bridge;
 R_{26} , R_{27} , R_{28} and R_{29} independently of one another denote hydrogen or, in pairs, a
 30 $-(CH_2)_2-$, $-(CH_2)_3-$ or $-CH=CH-$ bridge, E_3 and E_4 independently of one another denote O,
 $N-CN$, $C(CN)_2$ or $N-C_6$ - to C_{10} -aryl, R_{34} and R_{35} independently denote hydrogen, C_1 to C_{18}
 -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro, C_1 to C_{18} -alkoxycarbonyl or C_6 to C_{10} -
 aryl, R_{30} to R_{33} independently of one another denote hydrogen or C_1 - C_6 -alkyl, or R_{30} and
 R_{26} and/or R_{31} and R_{27} form a $-CH=CH-CH=CH-$ bridge, E_1 and E_2 independently of one
 35 another denote O, S, NR_{36} or $C(R_{36})_2$ or E_1 and E_2 together form a $-N-(CH_2)_2-N-$ bridge,
 R_{36} denotes C_1 to C_{18} -alkyl, C_2 to C_{12} -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or
 C_6 to C_{10} -aryl, Z_1 denotes a direct bond, $-CH=CH-$, $-C(CH_3)=CH-$,
 $-C(CN)=CH-$, $-CCl=CCl-$, $-C(OH)=CH-$, $-CCl=CH-$, $-C\equiv C-$, $-CH=N-N=CH-$, $-C(CH_3)=N-$,
 $N=C(CH_3)-$ or $-CCl=N-N=CCl-$, Z_2 denotes $-(CH_2)_r-$ or $-CH_2-C_6H_4-CH_2-$, $r=1-10$, C^+ is
 40 selected from the group consisting of bis(trifluoromethylsulfonyl)imide $((CF_3SO_2)_2N^+)$,
 bis(perfluoroethylsulfonyl)imide $((CF_3CF_2SO_2)_2N^+)$ and
 tris(trifluoromethylsulfonyl)methide $((CF_3SO_2)_3C^+)$, and D^+ is selected from the group

consisting of halogen anion, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , and $\text{CH}_3(\text{C}_6\text{H}_4)\text{SO}_3^-$, trifluoromethylsulfonate (CF_3SO_3^-), bis(trifluoromethylsulfonyl)imide
45 $((\text{CF}_3\text{SO}_2)_2\text{N}^-)$, bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-)$ and tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^-)$.

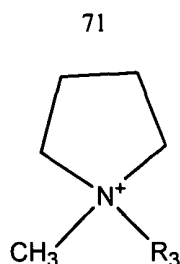
10. The electrolyte solution claim 1, further comprising at least one additive selected from the group consisting of non-ionic cosolvents, polymers, thixotropic agents, and UV stabilizers.

11. An electro-optic device comprising at least one chamber and, as the electrolyte medium inside the chamber, an electrolyte solution having a T_g of less than about -40°C and comprising at least one bifunctional redox dye dissolved in an ionic liquid solvent.

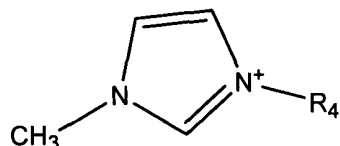
12. The electro-optic device of claim 11, wherein said bifunctional redox dye comprises at least one redox active anodic moiety and at least one redox active cathodic moiety.

13. The electro-optic device of claim 11, wherein said bifunctional redox dye comprises at least one energy receptor moiety and at least one redox active anodic moiety, at least one energy receptor moiety and at least one redox active cathodic moiety, or at least one energy receptor moiety and at least one redox active anodic moiety and at least
5 one redox active cathodic moiety.

14. The electro-optic device of claim 11, wherein said ionic liquid comprises at least one cation selected from the group consisting of lithium cation and quaternary ammonium cations, wherein said quaternary ammonium cations are selected from the group consisting of pyridinium, pyridazinium, pyrimidinium, pyrazinium, imidazolium, pyrazolium,
5 thiazolium, oxazolium, triazolium, tetraalkylammonium, N-methyl morpholinium, cations of the formula $[(\text{CH}_3\text{CH}_2)_3\text{N}(\text{R}_1)]^+$, wherein R_1 is alkyl having 2-10 carbons, cations of the formula $[(\text{CH}_3)_2(\text{CH}_3\text{CHCH}_3)\text{N}(\text{R}_2)]^+$, wherein R_2 is alkyl having 2-10 carbons, cations having the structural formula



10 wherein R₃ is alkyl having 2-10 carbons, and cations having the structural formula

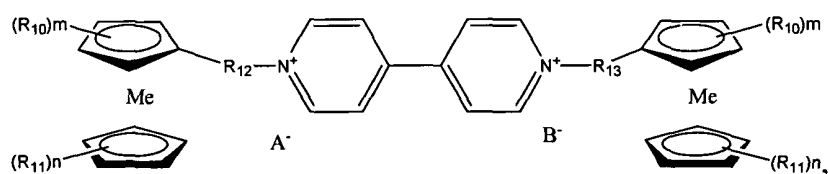


wherein R₄ is alkyl having 2-10 carbons.

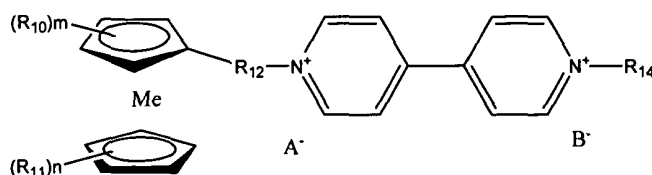
15. The electro-optic device of claim 11, wherein said ionic liquid comprises at least one anion selected from the group consisting of trifluoromethylsulfonate (CF₃SO₃⁻), bis(trifluoromethylsulfonyl)imide ((CF₃SO₂)₂N⁻), bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻).

16. The electro-optic device of claim 12, wherein said anodic moiety of said bifunctional redox dye comprises a pyrazoline, metallocene, phenylenediamine, benzidine, phenoxadine, phenothiazine, tetrafulvalene or phenazine, and said cathodic moiety of said bifunctional redox dye comprises a viologen or anthraquinone.

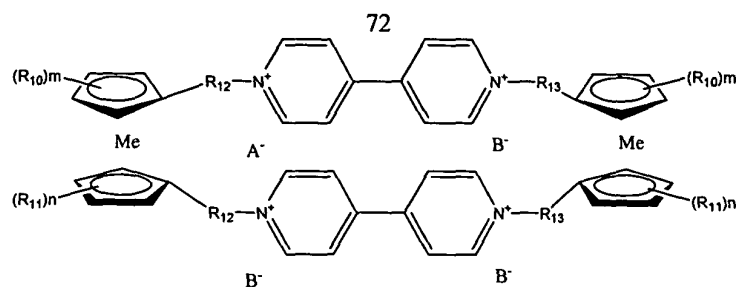
17. The electro-optic device of claim 11, wherein said bifunctional redox dye is a compound having the structural formula



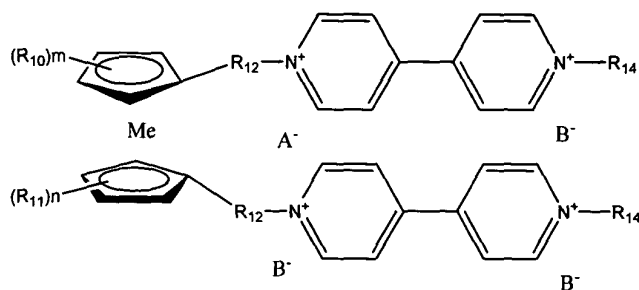
or having the structural formula



or having the structural formula



or having the structural formula



- 10 wherein A⁻ is selected from the group consisting of trifluoromethylsulfonate (CF₃SO₃⁻), bis(trifluoromethylsulfonyl)imide ((CF₃SO₂)₂N⁻), bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻); B⁻ is selected from the group consisting of a halogen anion, ClO₄⁻, BF₄⁻, PF₆⁻, AsF₆⁻, SbF₆⁻, CH₃COO⁻, and CH₃(C₆H₄)SO₃⁻, trifluoromethylsulfonate (CF₃SO₃⁻), bis(trifluoromethylsulfonyl)imide
- 15 ((CF₃SO₂)₂N⁻), bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻); wherein R₁₀ and R₁₁ are each independently a hydrocarbon group selected from the group consisting of an alkyl, alkenyl and aryl group having 1 to 10 carbon atoms, in the case where R₁₀ or R₁₁ is an aryl group, the aryl group forms a condensed ring together with a cyclopentadienyl ring; wherein m=0-
- 20 4; wherein n=0-4; wherein R₁₂ and R₁₃ are each independently a hydrocarbon residue having 1 to 20 carbon atoms, or alkylene groups having ester-bond unit, ether-bond unit, amide-bond unit, thioether-bond unit, amine-bond unit, urethane-bond unit, or silyl unit in the part of hydrocarbon groups, and R₁₄ is a hydrocarbon group selected from the group consisting of an alkyl, cycloalkyl, alkenyl, aryl, or aralkyl group having 1 to 20 carbon
- 25 atoms, a heterocyclic group having 4 to 20 carbon atoms, and a substituted hydrocarbon or heterocyclic group obtained by substituting part of hydrogens of the hydrocarbon group or heterocyclic group with a substituent group; and Me represents Cr, Co, Fe, Mn, Ni, Os, Ru,

V, Mo(X)(Q), Nb(X)(Q), Ti(X)(Q), V(X)(Q) or Zr(X)(Q) wherein X and Q are each independently selected from the group consisting of hydrogen, halogen, an alkyl group having 1 to 12 carbon atoms, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , $\text{CH}_3(\text{C}_6\text{H}_4)\text{SO}_3^-$, trifluoromethylsulfonate (CF_3SO_3^-), bis(trifluoromethylsulfonyl)imide ($(\text{CF}_3\text{SO}_2)_2\text{N}^-$), bis(perfluoroethylsulfonyl)imide ($(\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-$) and tris(trifluoromethylsulfonyl)methide ($(\text{CF}_3\text{SO}_2)_3\text{C}^-$);

or having the formula

Cat₁-An₁,

or having the formula

Cat₁-Bridge₁-An₁,

or having the formula

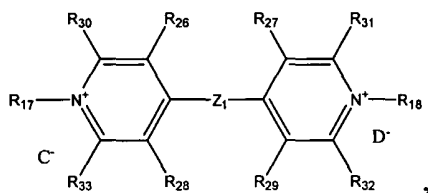
Cat₁-Bridge₁-An₁-Bridge₂-Cat₂,

or having the formula

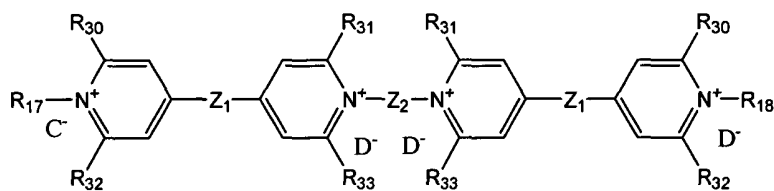
An₂-Bridge₂-Cat₁-Bridge₁-An₁,

wherein Cat₁-An₁ represents a charge transfer complex;

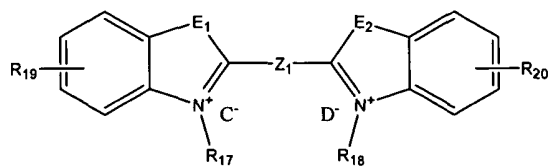
wherein Cat₁ and Cat₂ independently represent a radical having the structural formula



or having the structural formula

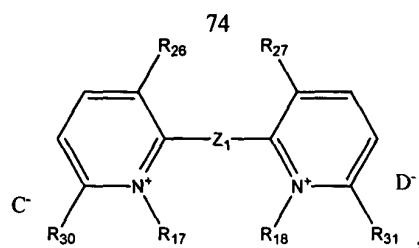


or having the structural formula

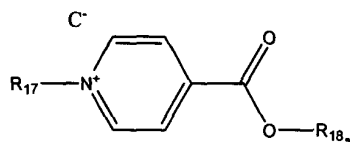


or having the structural formula

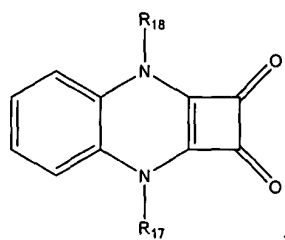
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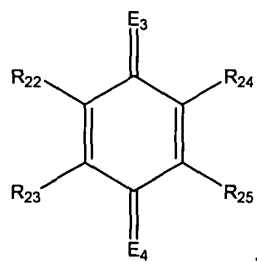
or having the structural formula



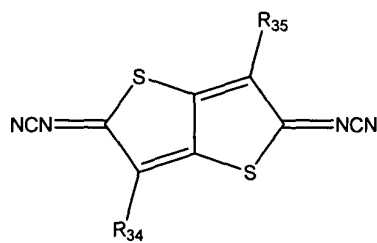
or having the structural formula



55 or having the structural formula



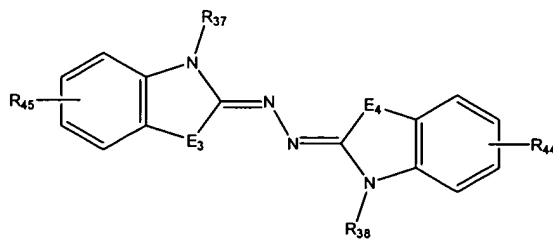
or having the structural formula



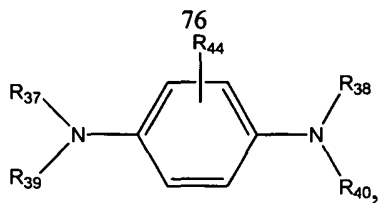
wherein R₁₇ and R₁₈ independently of one another denote C₁ to C₁₈ -alkyl, C₂ to C₁₂ -
60 alkenyl, C₃ to C₇ -cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl or R₁₇ and R₁₈ together
form a -(CH₂)₂-, -(CH₂)₃-, or -CH=CH- bridge, R₁₉, R₂₀ and R₂₂ to R₂₅ independently of
one another denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₄ -alkoxy, halogen, cyano, nitro or

C_1 to C_{18} -alkoxycarbonyl or R_{22} and R_{23} and/or R_{24} and R_{25} form a $-\text{CH}=\text{CH}-\text{CH}=\text{CH}-$ bridge; R_{26} , R_{27} , R_{28} and R_{29} independently of one another denote hydrogen or, in pairs, a
65 $-(\text{CH}_2)_2-$, $-(\text{CH}_2)_3-$ or $-\text{CH}=\text{CH}-$ bridge, E_3 and E_4 independently of one another denote O, N-CN, $\text{C}(\text{CN})_2$ or N- C_6 - to C_{10} -aryl, R_{34} and R_{35} independently denote hydrogen, C_1 to C_{18} -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro, C_1 to C_{18} -alkoxycarbonyl or C_6 to C_{10} -aryl, R_{30} to R_{33} independently of one another denote hydrogen or C_1 to C_6 -alkyl, or R_{30} and R_{26} and/or R_{31} and R_{27} form a $-\text{CH}=\text{CH}-\text{CH}=\text{CH}-$ bridge, E_1 and E_2 independently of
70 one another denote O, S, NR_{36} or $\text{C}(\text{R}_{36})_2$ or E_1 and E_2 together form a $-\text{N}-(\text{CH}_2)_2-\text{N}-$ bridge, R_{36} denotes C_1 to C_{18} -alkyl, C_2 to C_{12} -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or C_6 to C_{10} -aryl, Z_1 denotes a direct bond, $-\text{CH}=\text{CH}-$, $-\text{C}(\text{CH}_3)=\text{CH}-$, $-\text{C}(\text{CN})=\text{CH}-$, $-\text{CCl}=\text{CCl}-$, $-\text{C}(\text{OH})=\text{CH}-$, $-\text{CCl}=\text{CH}-$, $-\text{C}\equiv\text{C}-$, $-\text{CH}=\text{N}-\text{N}=\text{CH}-$, $-\text{C}(\text{CH}_3)=\text{N}-\text{N}=\text{C}(\text{CH}_3)-$ or $-\text{CCl}=\text{N}-\text{N}=\text{CCl}-$, Z_2 denotes $-(\text{CH}_2)_r-$ or $-\text{CH}_2-\text{C}_6\text{H}_4-\text{CH}_2-$, $r=1-10$, C^- is
75 selected from the group consisting of bis(trifluoromethylsulfonyl)imide $((\text{CF}_3\text{SO}_2)_2\text{N}^-)$, bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-)$ and tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^-)$, and D^- is selected from the group consisting of halogen anion, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , and $\text{CH}_3(\text{C}_6\text{H}_4)\text{SO}_3^-$, trifluoromethylsulfonate $(\text{CF}_3\text{SO}_3^-)$, bis(trifluoromethylsulfonyl)imide
80 $((\text{CF}_3\text{SO}_2)_2\text{N}^-)$, bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-)$ and tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^-)$, wherein bonding to the bridge member bridge₁ or bridge₂ is effected via one of the radicals R_{17} - R_{36} , and the radicals mentioned then represent a direct bond,
and wherein An_1 and An_2 independently represent radicals having the structural formula:

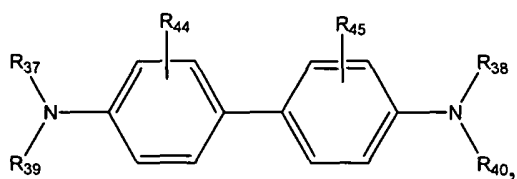
85



or having the structural formula

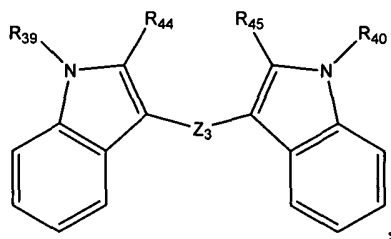


or having the structural formula

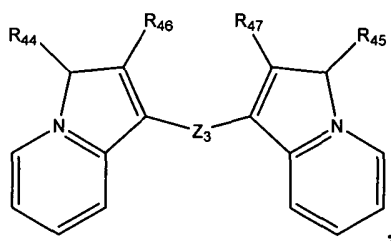


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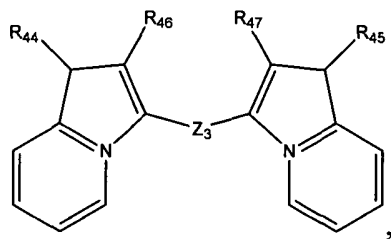
or having the structural formula



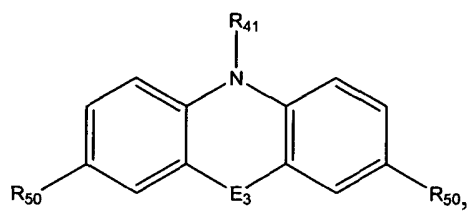
or having the structural formula



95 or having the structural formula

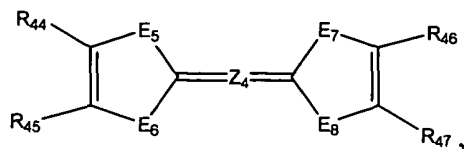


or having the structural formula



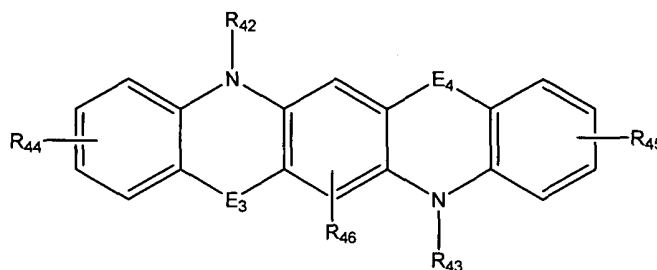
77

or having the structural formula

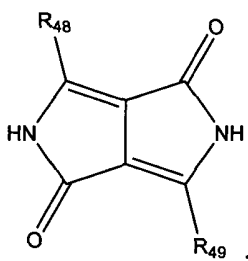


100

or having the structural formula

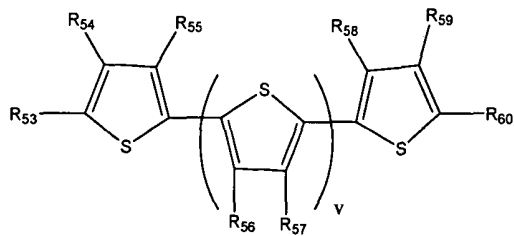


or having the structural formula



105

or having the structural formula



or wherein An₁ or An₂ independently represent a metal salt comprising titanium (III), vanadium (III), vanadium (IV), iron (II), cobalt (II), copper (I), silver (I), indium (I), tin (II), antimony (III), bismuth (III), cerium (III), samarium (II), dysprosium (II), ytterbium (II), or europium (II), wherein R₃₇ to R₄₃ independently of one another denote C₁ to C₁₈ -alkyl, C₂ to C₁₂ -alkenyl, C₃ to C₇ -cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl, and R₄₁ to R₄₃ additionally denote hydrogen, R₄₄ to R₅₀ independently of one another denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₁₈ -alkoxy, halogen, cyano, nitro, C₁ to C₁₈ -alkoxycarbonyl or C₆ to C₁₀ -aryl and R₄₈ and R₄₉ additionally denote an optionally benzo-

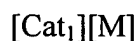
110

115 fused aromatic or quasiaromatic five- or six-membered heterocyclic ring and R_{50}
additionally independently denotes $N(R_{51})(R_{52})$, R_{44} and R_{45} and/or R_{46} and R_{47} form a -
(CH_2)₃-, -(CH_2)₄-, -(CH_2)₅- or -CH=CH-CH=CH- bridge, Z_3 denotes a direct bond or a -
CH=CH- or -N=N- bridge, $=Z_4=$ denotes a direct double bond or a =CH-CH= or =N-N=
bridge, E_3 and E_4 independently of one another denote O, S, NR_{51} , $C(R_{51})(R_{52})$, C=O or
120 SO_2 , E_5 to E_8 independently of one another denote S, Se or NR_{51} , R_{51} and R_{52}
independently of one another denote C_1 to C_{12} -alkyl, C_2 to C_8 -alkenyl, C_3 to C_7 -
cycloalkyl, C_7 to C_{15} -aralkyl or C_6 to C_{10} -aryl, R_{53} to R_{60} independently of one another
denote hydrogen, C_1 - to C_6 -alkyl, C_1 to C_{18} -alkoxy, cyano, C_1 to C_{18} -alkoxycarbonyl or
 C_6 to C_{10} -aryl, or R_{53} and R_{54} and R_{59} and R_{60} independently of one another together form
125 a -(CH_2)₃-, -(CH_2)₄- or -CH=CH-CH=CH- bridge, $v=0-10$, wherein bonding to the bridge
member Bridge₁ or Bridge₂ is effected by one of the radicals R_{37} - R_{54} , or R_{60} and the
radicals mentioned then represent a direct bond, and Bridge₁ or Bridge₂ independently
represents a bridge member of the formula -(CH_2)_n- or -(Y_1)_s(CH_2)_m-(Y_2)_o-(CH_2)_p-(Y_3)_q-,
each of which is optionally substituted by C_1 to C_{18} -alkoxy, halogen or phenyl, Y_1 to Y_3
130 independently of one another independently represent O, S, NR_{61} , COO, CONH,
NHCONH, cyclopentanediy, cyclohexanediy, phenylene or naphthylene, beta-
dicarbonyls, R_{61} denotes C_1 to C_6 -alkyl, C_2 to C_6 -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -
aralkyl or C_6 - to C_{10} -aryl, $n=0-12$, $m=0-8$, $p=0-12$, $o=0-6$, $q=0-1$, and $s=0-1$.

18. The electrolyte solution of claim 13, wherein said bifunctional redox dye comprises
a redox active moiety comprising a pyrazoline, metallocene, phenylenediamine, benzidine,
phenoxadine, phenothiazine, tetrafulvalene, phenazine, viologen or anthraquinone, and an
energy receptor moiety comprising a benzophenone, benzotriazole, or cyanoacrylate.

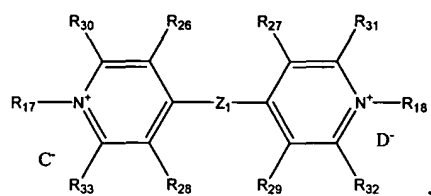
19. The electrolyte solution claim 11, further comprising at least one additive selected
from the group consisting of non-ionic cosolvents, polymers, thixotropic agents, and UV
stabilizers.

20. The electrolyte solution of claim 11, wherein said bifunctional redox dye comprises
a compound having the formula

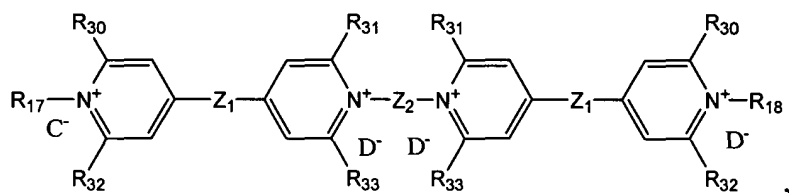


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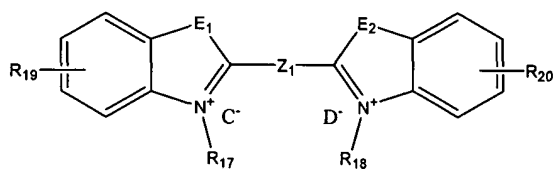
- wherein M represents a metal salt comprising titanium (III), vanadium (III), vanadium (IV), iron (II), cobalt (II), copper (I), silver (I), indium (I), tin (II), antimony (III), bismuth (III), cerium (III), samarium (II), dysprosium (II), ytterbium (II), or europium (II);
- wherein Cat₁ represents a ligand having the structural formula



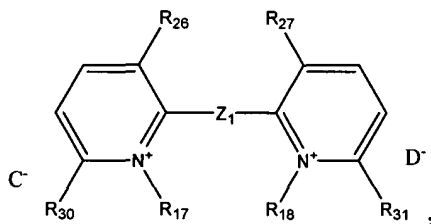
- 10 or having the structural formula



or having the structural formula

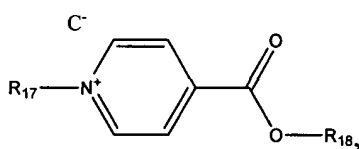


or having the structural formula

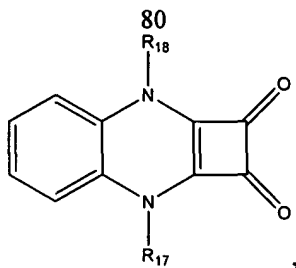


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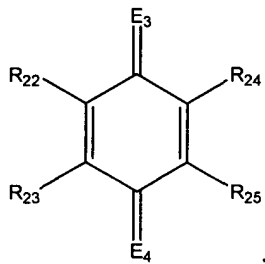
or having the structural formula



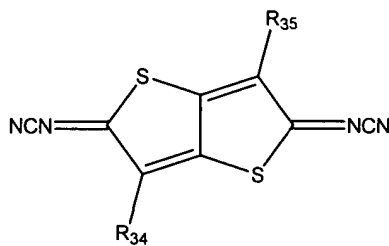
or having the structural formula



20 or having the structural formula



or having the structural formula

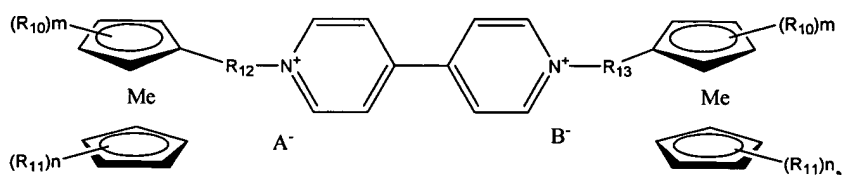


wherein R_{17} and R_{18} independently of one another denote C_1 to C_{18} -alkyl, C_2 to C_{12} -
 25 alkenyl, C_3 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or C_6 to C_{10} -aryl or R_{17} and R_{18} together
 form a $-(CH_2)_2-$, $-(CH_2)_3-$, or $-CH=CH-$, R_{19} , R_{20} and R_{22} to R_{25} independently of one
 another denote hydrogen, C_1 to C_{18} -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro or C_1 to
 C_{18} -alkoxycarbonyl or R_{22} and R_{23} and/or R_{24} and R_{25} form a $-CH=CH-CH=CH-$ bridge;
 R_{26} , R_{27} , R_{28} and R_{29} independently of one another denote hydrogen or, in pairs, a
 30 $-(CH_2)_2-$, $-(CH_2)_3-$ or $-CH=CH-$ bridge, E_3 and E_4 independently of one another denote O,
 N-CN, $C(CN)_2$ or N- C_6 - to C_{10} -aryl, R_{34} and R_{35} independently denote hydrogen, C_1 to C_{18}
 -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro, C_1 to C_{18} -alkoxycarbonyl or C_6 to C_{10} -
 aryl, R_{30} to R_{33} independently of one another denote hydrogen or C_1 - C_6 -alkyl, or R_{30} and
 R_{26} and/or R_{31} and R_{27} form a $-CH=CH-CH=CH-$ bridge, E_1 and E_2 independently of one
 35 another denote O, S, NR_{36} or $C(R_{36})_2$ or E_1 and E_2 together form a $-N-(CH_2)_2-N-$ bridge,
 R_{36} denotes C_1 to C_{18} -alkyl, C_2 to C_{12} -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or
 C_6 to C_{10} -aryl, Z_1 denotes a direct bond, $-CH=CH-$, $-C(CH_3)=CH-$,

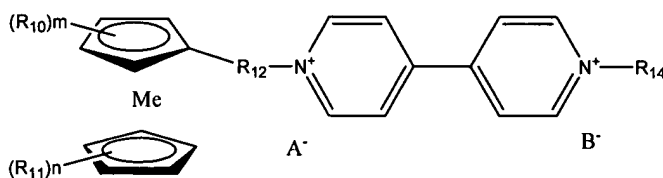
81

-C(CN)=CH-, -CCl=CCl-, -C(OH)=CH-, -CCl=CH-, -C≡C-, -CH=N-N=CH-, -C(CH₃)=N-
N=C(CH₃)- or -CCl=N-N=CCl-, Z₂ denotes -(CH₂)_r- or -CH₂-C₆H₄-CH₂-, r=1-10, C⁻ is
40 selected from the group consisting of bis(trifluoromethylsulfonyl)imide ((CF₃SO₂)₂N⁻),
bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and
tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻), and D⁻ is selected from the group
consisting of halogen anion, ClO₄⁻, BF₄⁻, PF₆⁻, AsF₆⁻, SbF₆⁻, CH₃COO⁻, and
CH₃(C₆H₄)SO₃⁻, trifluoromethylsulfonate (CF₃SO₃⁻), bis(trifluoromethylsulfonyl)imide
45 ((CF₃SO₂)₂N⁻), bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and
tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻).

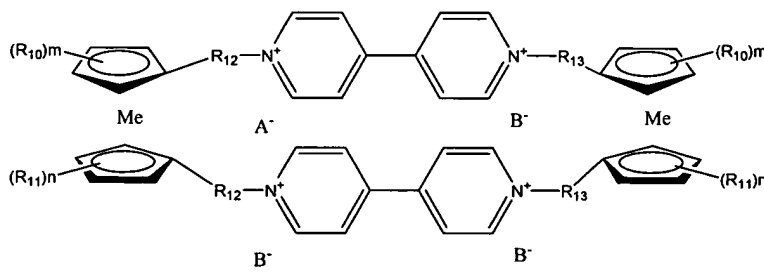
21. A compound having the structural formula



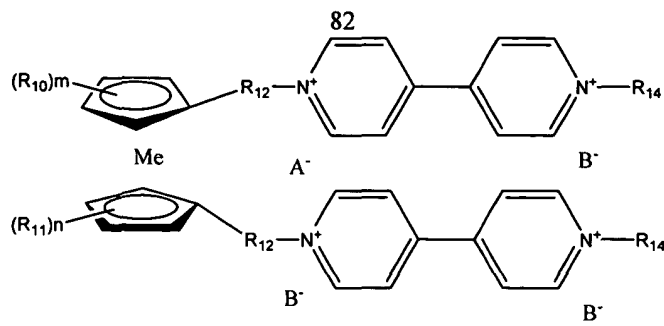
or having the structural formula



5 or having the structural formula

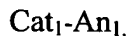


or having the structural formula



wherein A⁻ is selected from the group consisting of trifluoromethylsulfonate (CF₃SO₃⁻),
 10 bis(trifluoromethylsulfonyl)imide ((CF₃SO₂)₂N⁻), bis(perfluoroethylsulfonyl)imide
 ((CF₃CF₂SO₂)₂N⁻) and tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻); B⁻ is selected
 from the group consisting of a halogen anion, ClO₄⁻, BF₄⁻, PF₆⁻, AsF₆⁻, SbF₆⁻, CH₃COO⁻,
 and CH₃(C₆H₄)SO₃⁻, trifluoromethylsulfonate (CF₃SO₃⁻), bis(trifluoromethylsulfonyl)imide
 ((CF₃SO₂)₂N⁻), bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and
 15 tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻); wherein R₁₀ and R₁₁ are each
 independently a hydrocarbon group selected from the group consisting of an alkyl, alkenyl
 and aryl group having 1 to 10 carbon atoms, in the case where R₁₀ or R₁₁ is an aryl group,
 the aryl group forms a condensed ring together with a cyclopentadienyl ring; wherein m=0-
 4; wherein n=0-4; wherein R₁₂ and R₁₃ are each independently a hydrocarbon residue
 20 having 1 to 20 carbon atoms, or alkylene groups having ester-bond unit, ether-bond unit,
 amide-bond unit, thioether-bond unit, amine-bond unit, urethane-bond unit, or silyl unit in
 the part of hydrocarbon groups, and R₁₄ is a hydrocarbon group selected from the group
 consisting of an alkyl, cycloalkyl, alkenyl, aryl, or aralkyl group having 1 to 20 carbon
 atoms, a heterocyclic group having 4 to 20 carbon atoms, and a substituted hydrocarbon or
 25 heterocyclic group obtained by substituting part of hydrogens of the hydrocarbon group or
 heterocyclic group with a substituent group; and Me represents Cr, Co, Fe, Mn, Ni, Os, Ru,
 V, Mo(X)(Q), Nb(X)(Q), Ti(X)(Q), V(X)(Q) or Zr(X)(Q) wherein X and Q are each
 independently selected from the group consisting of hydrogen, halogen, an alkyl group
 having 1 to 12 carbon atoms, ClO₄⁻, BF₄⁻, PF₆⁻, AsF₆⁻, SbF₆⁻, CH₃COO⁻, CH₃(C₆H₄)SO₃⁻,
 30 trifluoromethylsulfonate (CF₃SO₃⁻), bis(trifluoromethylsulfonyl)imide ((CF₃SO₂)₂N⁻),
 bis(perfluoroethylsulfonyl)imide ((CF₃CF₂SO₂)₂N⁻) and
 tris(trifluoromethylsulfonyl)methide ((CF₃SO₂)₃C⁻);

or having the formula



35 or having the formula



or having the formula



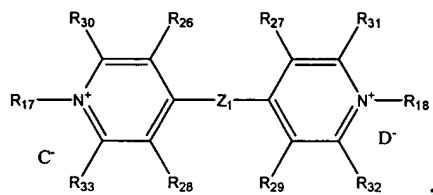
or having the formula

40

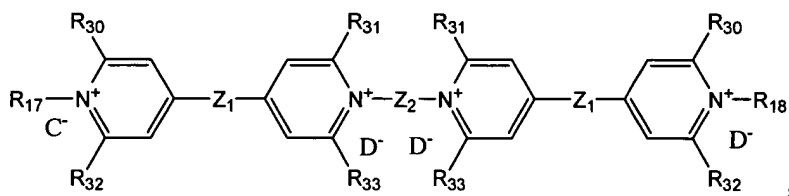


wherein $\text{Cat}_1\text{-An}_1$ represents a charge transfer complex;

wherein Cat_1 and Cat_2 independently represent a radical having the structural formula

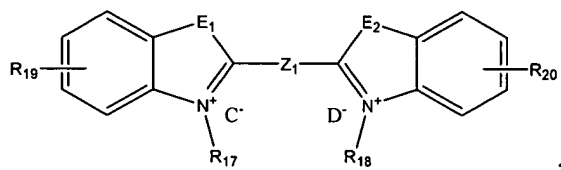


or having the structural formula

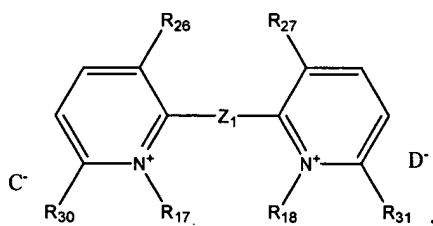


45

or having the structural formula

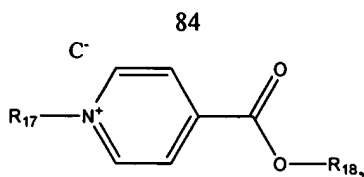


or having the structural formula

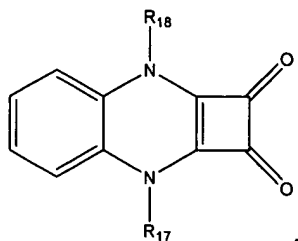


50

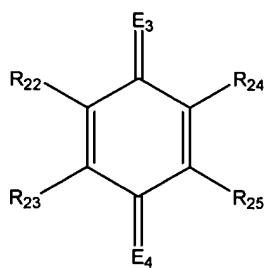
or having the structural formula



or having the structural formula

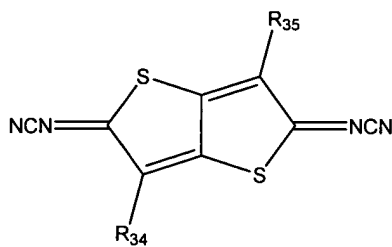


or having the structural formula



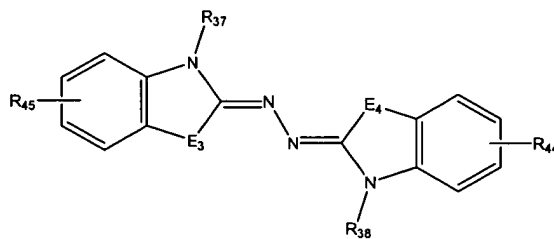
55

or having the structural formula

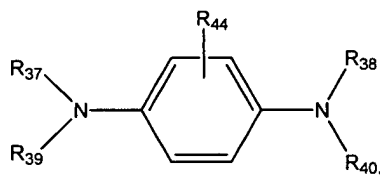


wherein R₁₇ and R₁₈ independently of one another denote C₁ to C₁₈ -alkyl, C₂ to C₁₂ -alkenyl, C₃ to C₇ -cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl or R₁₇ and R₁₈ together
60 form a -(CH₂)₂-, -(CH₂)₃-, or -CH=CH- bridge, R₁₉, R₂₀ and R₂₂ to R₂₅ independently of one another denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₄ -alkoxy, halogen, cyano, nitro or C₁ to C₁₈ -alkoxycarbonyl or R₂₂ and R₂₃ and/or R₂₄ and R₂₅ form a -CH=CH-CH=CH-
bridge; R₂₆, R₂₇, R₂₈ and R₂₉ independently of one another denote hydrogen or, in pairs, a
-(CH₂)₂-, -(CH₂)₃- or -CH=CH- bridge, E₃ and E₄ independently of one another denote O,
65 N-CN, C(CN)₂ or N-C₆ - to C₁₀-aryl, R₃₄ and R₃₅ independently denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₁₈ -alkoxy, halogen, cyano, nitro, C₁ to C₁₈ -alkoxycarbonyl or C₆ to C₁₀ -aryl, R₃₀ to R₃₃ independently of one another denote hydrogen or C₁ to C₆ -alkyl, or R₃₀

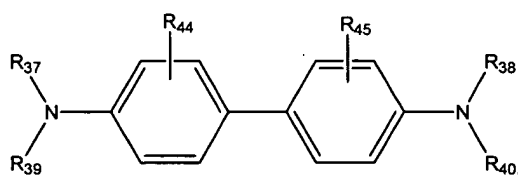
and R_{26} and/or R_{31} and R_{27} form a $-\text{CH}=\text{CH}-\text{CH}=\text{CH}-$ bridge, E_1 and E_2 independently of one another denote O, S, NR_{36} or $\text{C}(\text{R}_{36})_2$ or E_1 and E_2 together form a $-\text{N}-(\text{CH}_2)_2-\text{N}-$ bridge, R_{36} denotes C_1 to C_{18} -alkyl, C_2 to C_{12} -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or C_6 to C_{10} -aryl, Z_1 denotes a direct bond, $-\text{CH}=\text{CH}-$, $-\text{C}(\text{CH}_3)=\text{CH}-$, $-\text{C}(\text{CN})=\text{CH}-$, $-\text{CCl}=\text{CCl}-$, $-\text{C}(\text{OH})=\text{CH}-$, $-\text{CCl}=\text{CH}-$, $-\text{C}\equiv\text{C}-$, $-\text{CH}=\text{N}-\text{N}=\text{CH}-$, $-\text{C}(\text{CH}_3)=\text{N}-\text{N}=\text{C}(\text{CH}_3)-$ or $-\text{CCl}=\text{N}-\text{N}=\text{CCl}-$, Z_2 denotes $-(\text{CH}_2)_r-$ or $-\text{CH}_2-\text{C}_6\text{H}_4-\text{CH}_2-$, $r=1-10$, C^- is selected from the group consisting of bis(trifluoromethylsulfonyl)imide $((\text{CF}_3\text{SO}_2)_2\text{N}^-)$, bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-)$ and tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^-)$, and D^- is selected from the group consisting of halogen anion, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , and $\text{CH}_3(\text{C}_6\text{H}_4)\text{SO}_3^-$, trifluoromethylsulfonate $(\text{CF}_3\text{SO}_3^-)$, bis(trifluoromethylsulfonyl)imide $((\text{CF}_3\text{SO}_2)_2\text{N}^-)$, bis(perfluoroethylsulfonyl)imide $((\text{CF}_3\text{CF}_2\text{SO}_2)_2\text{N}^-)$ and tris(trifluoromethylsulfonyl)methide $((\text{CF}_3\text{SO}_2)_3\text{C}^-)$, wherein bonding to the bridge member bridge₁ or bridge₂ is effected via one of the radicals R_{17} - R_{36} , and the radicals mentioned then represent a direct bond, and wherein An_1 and An_2 independently represent radicals having the structural formula:



or having the structural formula

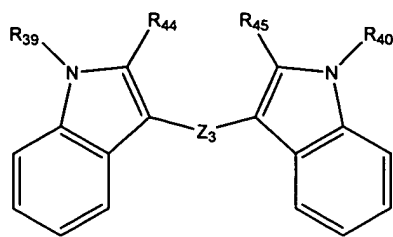


or having the structural formula

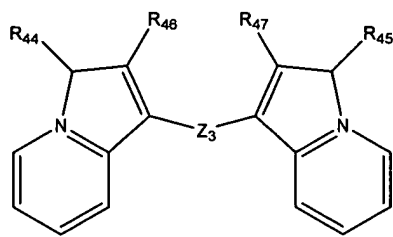


86

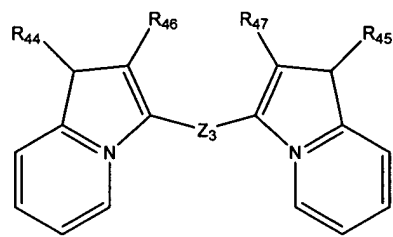
90 or having the structural formula



or having the structural formula

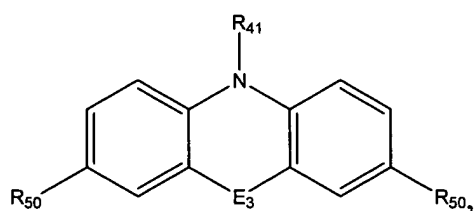


or having the structural formula

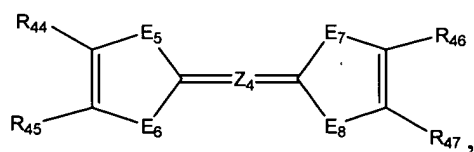


95

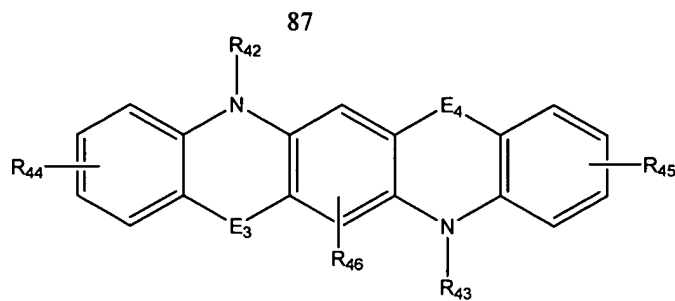
or having the structural formula



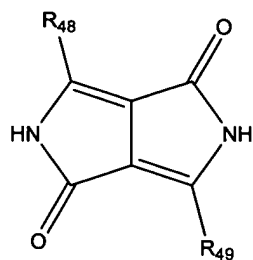
or having the structural formula



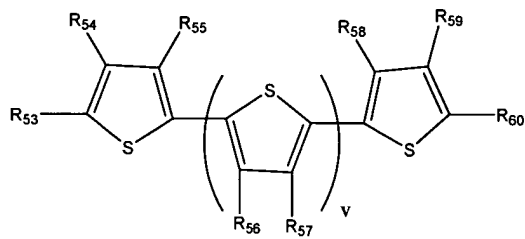
100 or having the structural formula



or having the structural formula



or having the structural formula



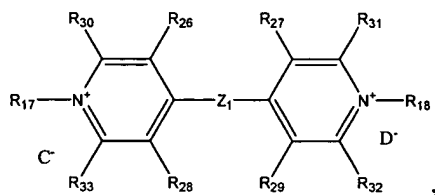
or wherein An₁ or An₂ independently represent a metal salt comprising titanium (III), vanadium (III), vanadium (IV), iron (II), cobalt (II), copper (I), silver (I), indium (I), tin (II), antimony (III), bismuth (III), cerium (III), samarium (II), dysprosium (II), ytterbium (II), or europium (II), wherein R₃₇ to R₄₃ independently of one another denote C₁ to C₁₈ -alkyl, C₂ to C₁₂ -alkenyl, C₃ to C₇ -cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl, and R₄₁ to R₄₃ additionally denote hydrogen, R₄₄ to R₅₀ independently of one another denote hydrogen, C₁ to C₁₈ -alkyl, C₁ to C₁₈ -alkoxy, halogen, cyano, nitro, C₁ to C₁₈ -alkoxycarbonyl or C₆ to C₁₀ -aryl and R₄₈ and R₄₉ additionally denote an optionally benzo-fused aromatic or quasiaromatic five- or six-membered heterocyclic ring and R₅₀ additionally independently denotes N(R₅₁)(R₅₂), R₄₄ and R₄₅ and/or R₄₆ and R₄₇ form a - (CH₂)₃-, -(CH₂)₄-, -(CH₂)₅- or -CH=CH-CH=CH- bridge, Z₃ denotes a direct bond or a -CH=CH- or -N=N- bridge, =Z₄= denotes a direct double bond or a =CH-CH= or =N-N= bridge, E₃ and E₄ independently of one another denote O, S, NR₅₁, C(R₅₁)(R₅₂), C=O or

SO₂, E₅ to E₈ independently of one another denote S, Se or NR₅₁, R₅₁ and R₅₂
 120 independently of one another denote C₁ to C₁₂ -alkyl, C₂ to C₈ -alkenyl, C₃ to C₇ -
 cycloalkyl, C₇ to C₁₅ -aralkyl or C₆ to C₁₀ -aryl, R₅₃ to R₆₀ independently of one another
 denote hydrogen, C₁ - to C₆ -alkyl, C₁ to C₁₈ -alkoxy, cyano, C₁ to C₁₈ -alkoxycarbonyl or
 C₆ to C₁₀ -aryl, or R₅₃ and R₅₄ and R₅₉ and R₆₀ independently of one another together form
 a -(CH₂)₃-, -(CH₂)₄- or -CH=CH-CH=CH- bridge, v=0-10, wherein bonding to the bridge
 125 member Bridge₁ or Bridge₂ is effected by one of the radicals R₃₇ -R₅₄, or R₆₀ and the
 radicals mentioned then represent a direct bond, and Bridge₁ or Bridge₂ independently
 represents a bridge member of the formula -(CH₂)_n- or -(Y₁)_s(CH₂)_m-(Y₂)_o-(CH₂)_p-(Y₃)_q-,
 each of which is optionally substituted by C₁ to C₁₈ -alkoxy, halogen or phenyl, Y₁ to Y₃
 independently of one another independently represent O, S, NR₆₁, COO, CONH,
 130 NHCONH, cyclopentanediyl, cyclohexanediyl, phenylene or naphthylene, beta-
 dicarbonyls, R₆₁ denotes C₁ to C₆ -alkyl, C₂ to C₆ -alkenyl, C₄ to C₇ -cycloalkyl, C₇ to C₁₅ -
 aralkyl or C₆ - to C₁₀ -aryl, n=0-12, m=0-8, p=0-12, o=0-6, q=0-1, and s=0-1.

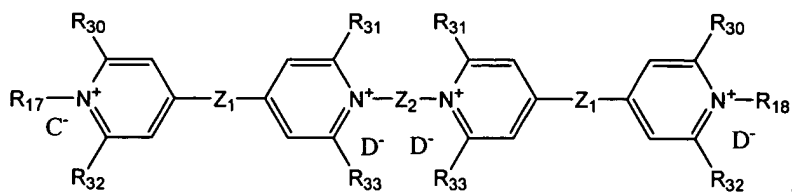
22. A compound having the structure the formula, wherein said bifunctional redox dye
 comprises a compound having the formula



wherein M represents a metal salt comprising titanium (III), vanadium (III), vanadium
 5 (IV), iron (II), cobalt (II), copper (I), silver (I), indium (I), tin (II), antimony (III), bismuth
 (III), cerium (III), samarium (II), dysprosium (II), ytterbium (II), or europium (II);
 wherein Cat₁ represents a ligand having the structural formula

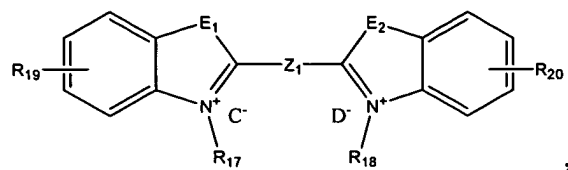


10 or having the structural formula

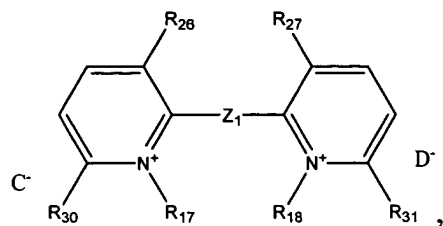


89

or having the structural formula

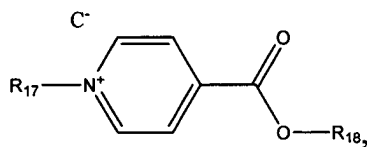


or having the structural formula

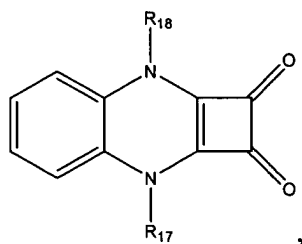


15

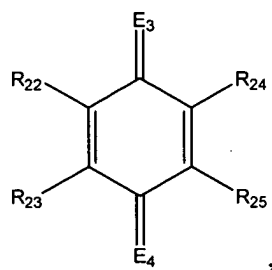
or having the structural formula



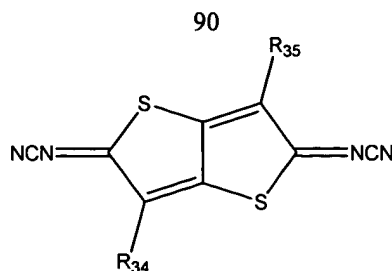
or having the structural formula



20 or having the structural formula



or having the structural formula



wherein R_{17} and R_{18} independently of one another denote C_1 to C_{18} -alkyl, C_2 to C_{12} -
 25 alkenyl, C_3 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or C_6 to C_{10} -aryl or R_{17} and R_{18} together
 form a $-(CH_2)_2-$, $-(CH_2)_3-$, or $-CH=CH-$, R_{19} , R_{20} and R_{22} to R_{25} independently of one
 another denote hydrogen, C_1 to C_{18} -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro or C_1 to
 C_{18} -alkoxycarbonyl or R_{22} and R_{23} and/or R_{24} and R_{25} form a $-CH=CH-CH=CH-$ bridge;
 R_{26} , R_{27} , R_{28} and R_{29} independently of one another denote hydrogen or, in pairs, a
 30 $-(CH_2)_2-$, $-(CH_2)_3-$ or $-CH=CH-$ bridge, E_3 and E_4 independently of one another denote O,
 N-CN, $C(CN)_2$ or N- C_6 - to C_{10} -aryl, R_{34} and R_{35} independently denote hydrogen, C_1 to C_{18}
 -alkyl, C_1 to C_{18} -alkoxy, halogen, cyano, nitro, C_1 to C_{18} -alkoxycarbonyl or C_6 to C_{10} -
 aryl, R_{30} to R_{33} independently of one another denote hydrogen or C_1 - C_6 -alkyl, or R_{30} and
 R_{26} and/or R_{31} and R_{27} form a $-CH=CH-CH=CH-$ bridge, E_1 and E_2 independently of one
 35 another denote O, S, NR_{36} or $C(R_{36})_2$ or E_1 and E_2 together form a $-N-(CH_2)_2-N-$ bridge,
 R_{36} denotes C_1 to C_{18} -alkyl, C_2 to C_{12} -alkenyl, C_4 to C_7 -cycloalkyl, C_7 to C_{15} -aralkyl or
 C_6 to C_{10} -aryl, Z_1 denotes a direct bond, $-CH=CH-$, $-C(CH_3)=CH-$,
 $-C(CN)=CH-$, $-CCl=CCl-$, $-C(OH)=CH-$, $-CCl=CH-$, $-C\equiv C-$, $-CH=N-N=CH-$, $-C(CH_3)=N-$
 $N=C(CH_3)-$ or $-CCl=N-N=CCl-$, Z_2 denotes $-(CH_2)_r-$ or $-CH_2-C_6H_4-CH_2-$, $r=1-10$, C^+ is
 40 selected from the group consisting of bis(trifluoromethylsulfonyl)imide $((CF_3SO_2)_2N^+)$,
 bis(perfluoroethylsulfonyl)imide $((CF_3CF_2SO_2)_2N^+)$ and
 tris(trifluoromethylsulfonyl)methide $((CF_3SO_2)_3C^+)$, and D^- is selected from the group
 consisting of halogen anion, ClO_4^- , BF_4^- , PF_6^- , AsF_6^- , SbF_6^- , CH_3COO^- , and
 $CH_3(C_6H_4)SO_3^-$, trifluoromethylsulfonate $(CF_3SO_3^-)$, bis(trifluoromethylsulfonyl)imide
 45 $((CF_3SO_2)_2N^+)$, bis(perfluoroethylsulfonyl)imide $((CF_3CF_2SO_2)_2N^+)$ and
 tris(trifluoromethylsulfonyl)methide $((CF_3SO_2)_3C^+)$.

23. A method for filling an empty electrooptic device with fluid comprising warm
 ionic liquid electrolyte solution, the device having relatively closely spaced plates, each

plate having an inwardly facing conductive surface, the plates being sealed around their periphery by a seal that encloses an area of each plate, comprising:

- (a) introducing a small opening into the seal of an empty device;
- (b) placing the empty device into a chamber along with a container of fluid comprising ionic liquid electrolyte solution;
- (c) evacuating the chamber;
- (d) lowering the empty device into the fluid such that the opening in the seal is located under the surface of the fluid;
- (e) warming at least a portion of the fluid to a temperature of at least 40°C;
- (f) exposing the fluid to a gas pressure greater than the pressure in the empty device to send the warm fluid into the device; and
- (g) sealing the gap in the peripheral seal of the device.